Microgravity

Teacher's Information for NBL & Simulator

Summary

One of NASA's most important tools for microgravity training is the Sonny Carter Neutral Buoyancy Laboratory (NBL) in Houston, Texas. It is one of the largest swimming pools in the world. It is one of the best ways for astronauts to train for space walks and and to learn how to work in a weightless environment.

Main Ideas

- Neutral buoyancy describes the property of having an equal tendency to float and sink in water. As a result, a neutrally buoyant object simply "hangs" in the water, neither sinking nor floating. This condition simulates some of the aspects of microgravity.
- Suited astronauts and other objects in the NBL are specially equipped with weights or flotation devices in order to achieve neutral buoyancy. In the NBL water tank, large and heavy objects are easily moved by crew members, just as they are in space.
- There are some important differences between working in microgravity and in the NBL.:

1. Astronauts are not weightless in the NBL. They can feel their own weight inside their suits. That is, they will always be pulled down within their suits and their bodies will always be resting against their suit, whether they are on their side, feet-down, or head-down.
2. In the NBL, water drag causes resistance to every motion. This makes some things easier or more difficult than they would be in microgravity. Moving large objects while under water is hard, but is easy in space. Retrieving a tool that has floated away is easier in water, because the astronaut can pull the tool back toward themselves by creating water currents with their hands.

Fascinating Facts

- The NBL is 202 ft long, 102 ft wide and 40 ft deep.
- It holds 6.2 million gallons of water, which is about the volume of a typical four-story building.
- The large size of the NBL tank allows it to hold a full-scale models of the orbiter.
- Two-way voice communication allows astronauts to communicate with controllers. One-way underwater speakers allow controllers to communicate with the SCUBA divers who assist the astronauts and watch over their safety.
- The NBL includes a wide variety of coordinating departments: safety, communications, video support, medicine, suit technicians, support SCUBA divers, crew training, test director. Simulating microgravity is a huge endeavor.